Testing
Very High Resolution

HARMONIE-AROME

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1. **HECTOR 750m e-suite**

2. Testing nesting & coupling options

3. Stability tests at 500m and 200m

HECTOR e-suite

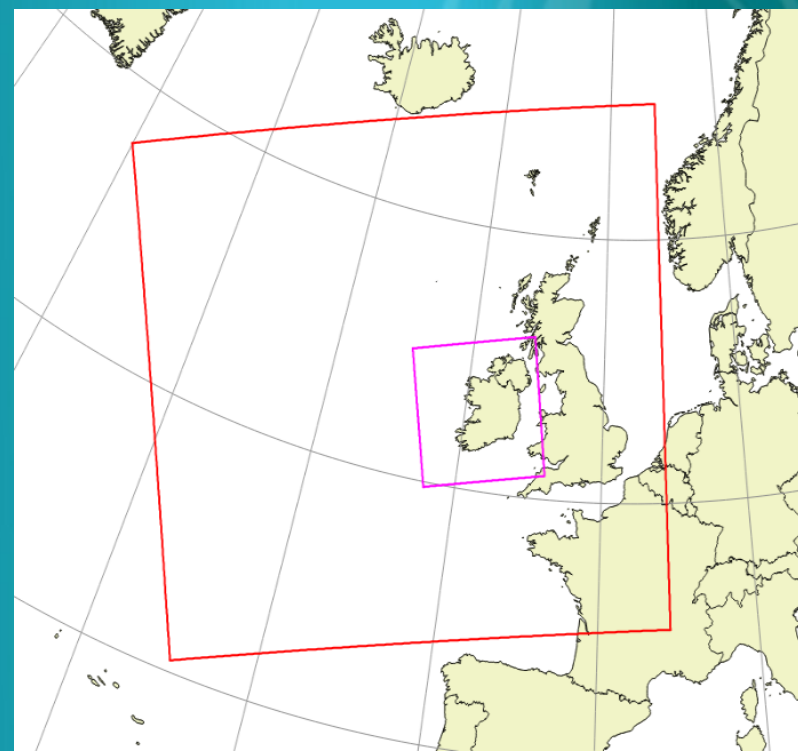
750m, 800 x 800 x 90

Cubic grid

TSTEP = 30s

RDAMP* = 10

3DVAR (not all satellites yet)

Operational IFS boundaries

Spun up from mid-Nov
Since Jan, 36-hour forecasts at 00, 12

HECTOR e-suite

Comparing with operations and UWC-W DINI domain

How much of the benefit is from the vertical?

HECTOR e-suite

Comparing with operations and UWC-W DINI domain
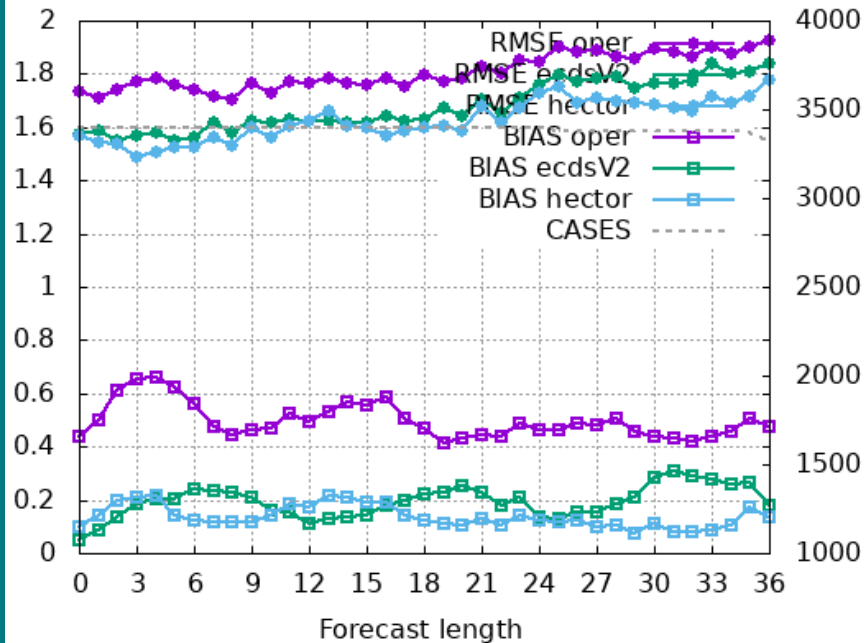How much of the benefit is from the vertical?

Next steps:

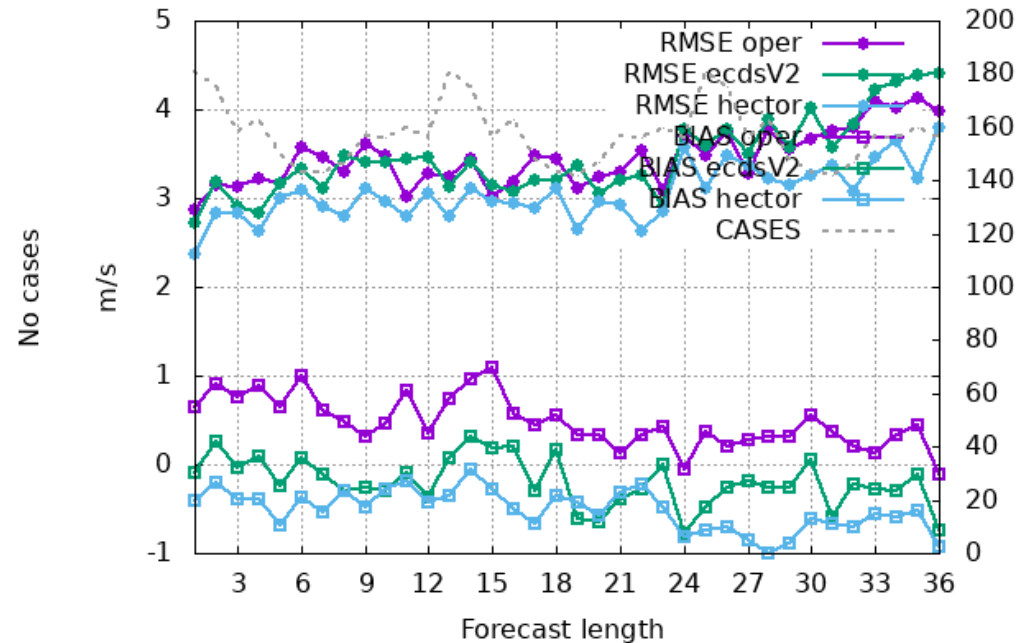Turn on extractGrib with 15-minute
output (c.f. poster by Conor Daly)

Seek feedback from users
(probably aviation and storm forecasting,
and coastal modelling)
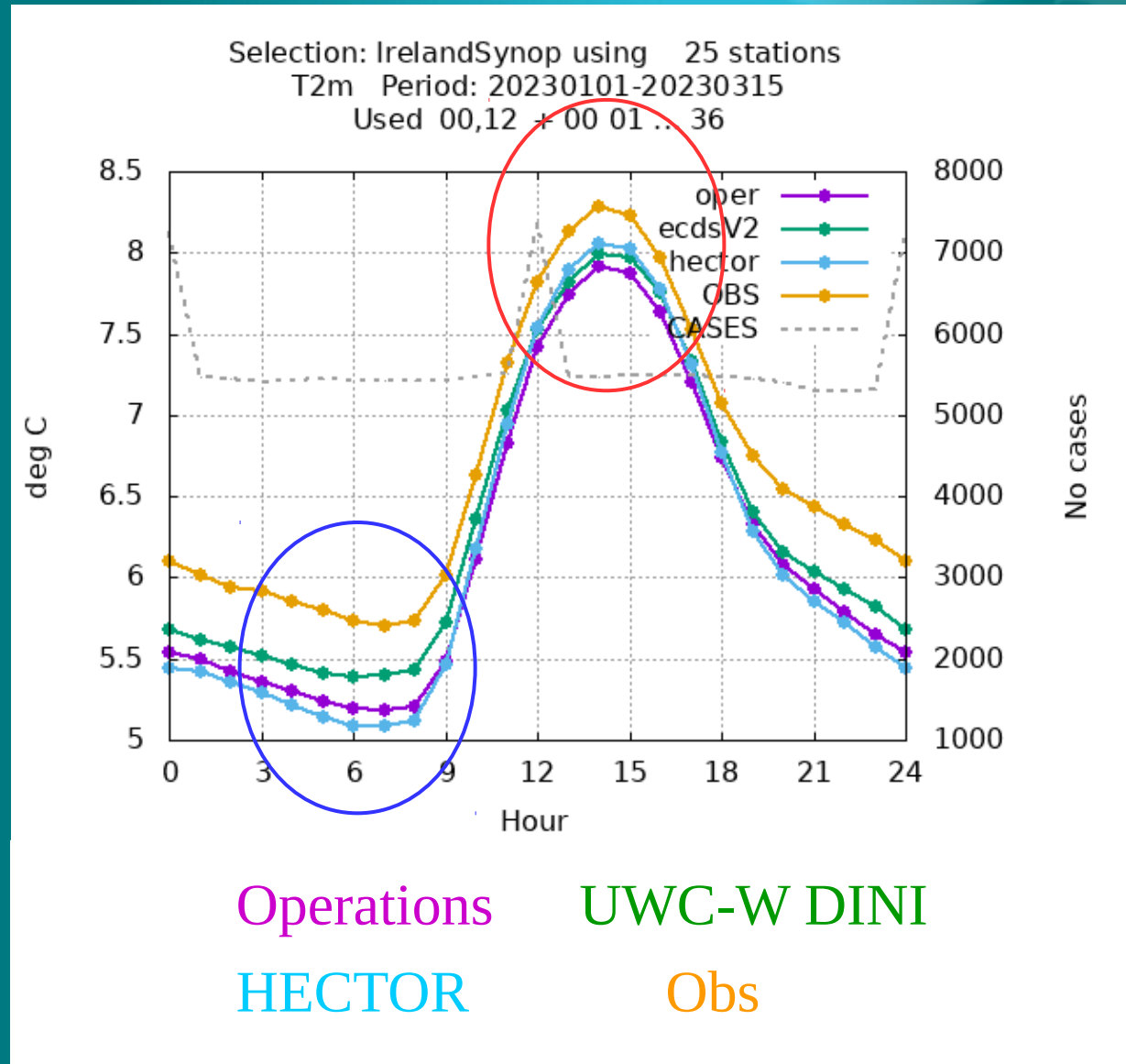
Operations
2.5km 65l

UWC-W DINI
2.0km 90l

HECTOR
750m 90l

Temperature

Cold bias in general

Effect of resolutions, both horizontal and vertical?

Some differences in physics with UWC-W (XRIMAX?)

Selection: IrelandSynop using   25 stations
T2m   Period: 20230101-20230315
Used 00,12 + 00 01 .. 36

Operations   UWC-W DINI

HECTOR   Obs

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LBC Options

Would HARMONIE-AROME LBC be better?

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Operationally, nesting at the same analysis time ("same_forecast") is impractical

UWC-W operations will produce a control forecast every hour, giving the option of 1, 2, 3-hour old LBC

LBC Options

Would HARMONIE-AROME LBC be better?

Operationally, nesting at the same analysis time ("same_forecast") is impractical

UWC-W operations will produce a control forecast every hour, giving the option of 1, 2, 3-hour old LBC

Also need to consider the boundary coupling of cloud water & ice, and hydrometeors

LBC Choice

Scores for stormy Feb 2022 period:

Best results with IFS boundaries
(MSLP, wind and temperature scores)

Next best was HARMONIE "same_forecast"

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No real differences among 1,2,3-hour old

So age of driving global boundaries
the biggest factor

LBC Choice

<u>Scores for stormy Feb 2022 period</u>:

Best results with IFS boundaries
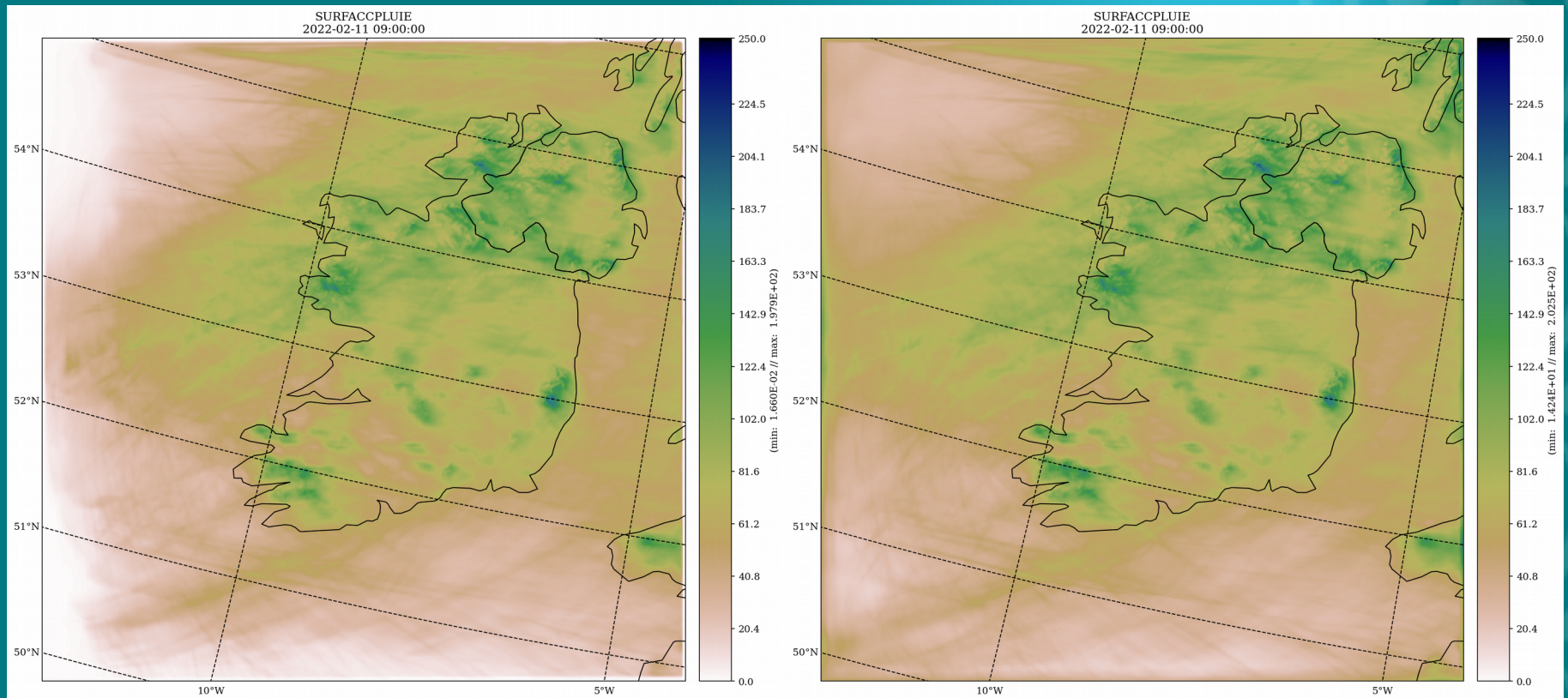(MSLP, wind and temperature scores)

Next best was HARMONIE "same_forecast"
No real differences among 1,2,3-hour old

HARMONIE LBC give more rain,
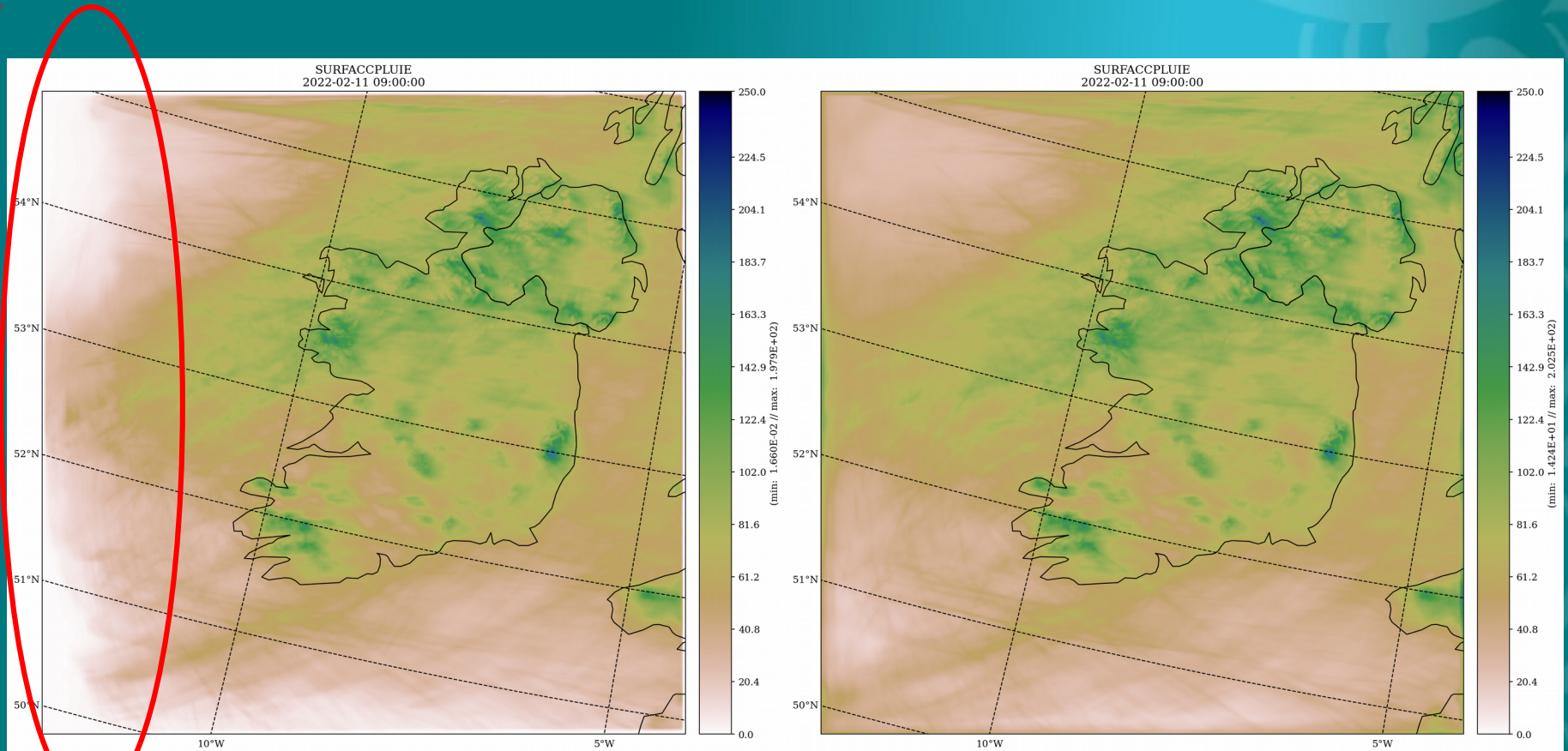*possibly too much, to be investigated...*

LBC Coupling

Accumulated rainfall 10-20th Feb 2022,
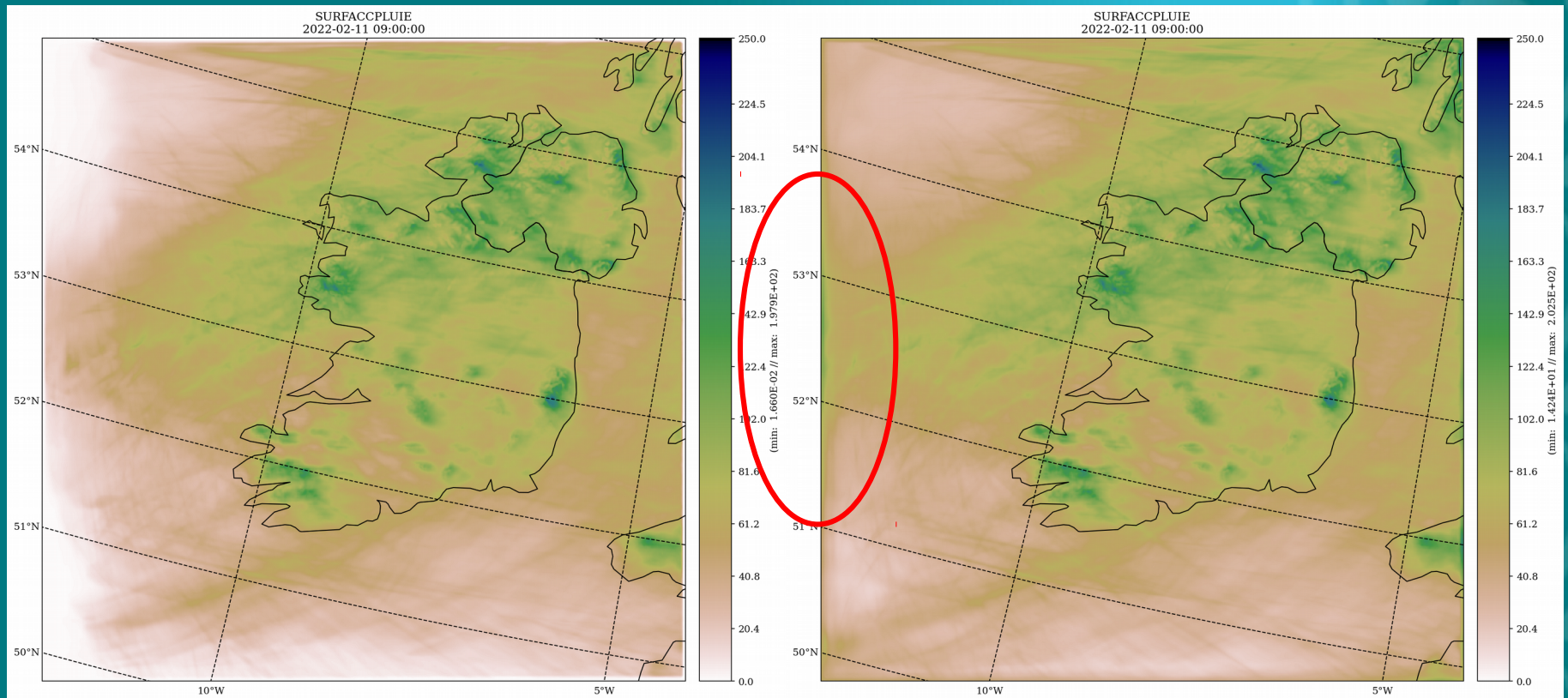experiments with IFS LBC and different coupling options

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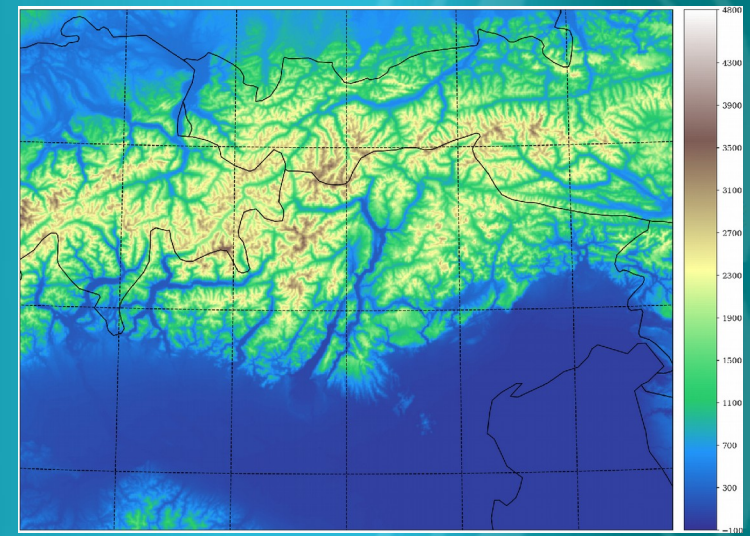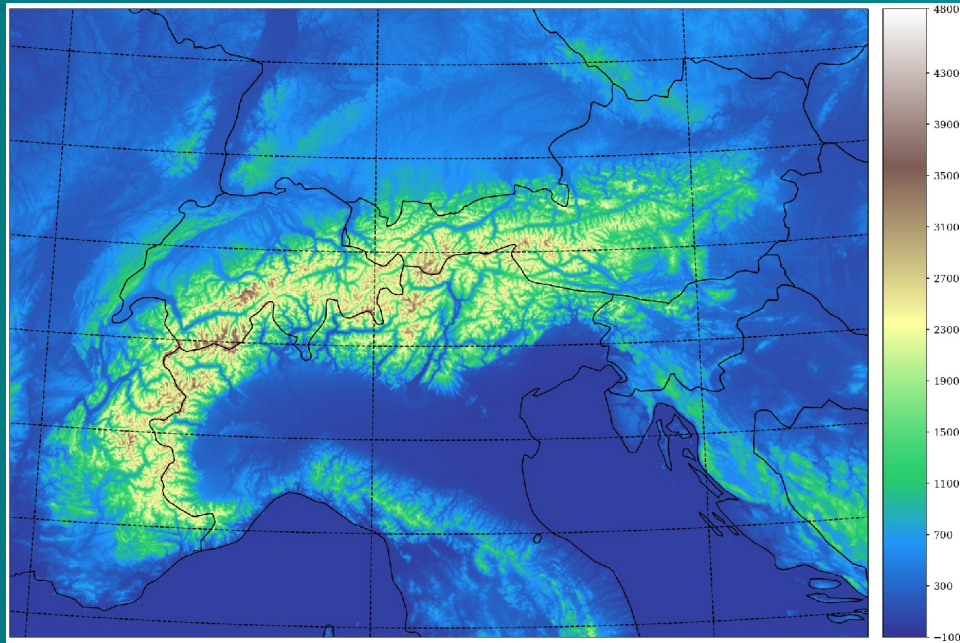
Similar dry boundaries with HARMONIE LBC if not coupling cloud and hydrometeors

Not much of an issue if domain of interest not too near the edge
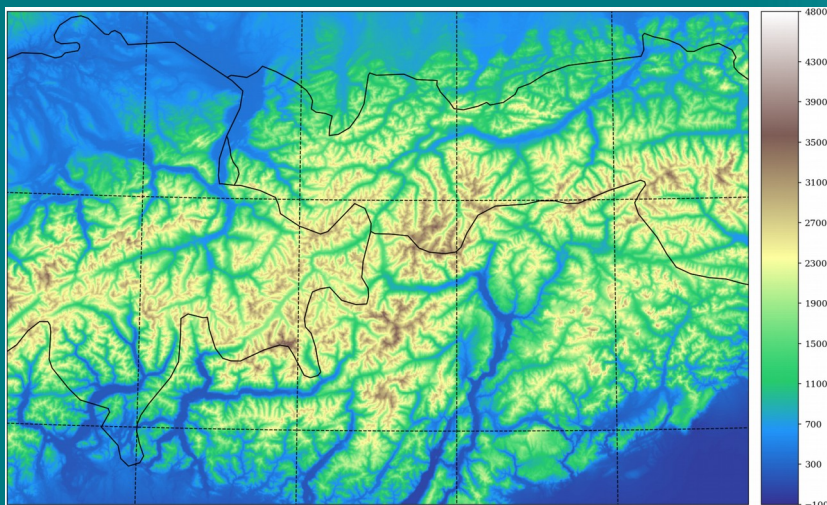
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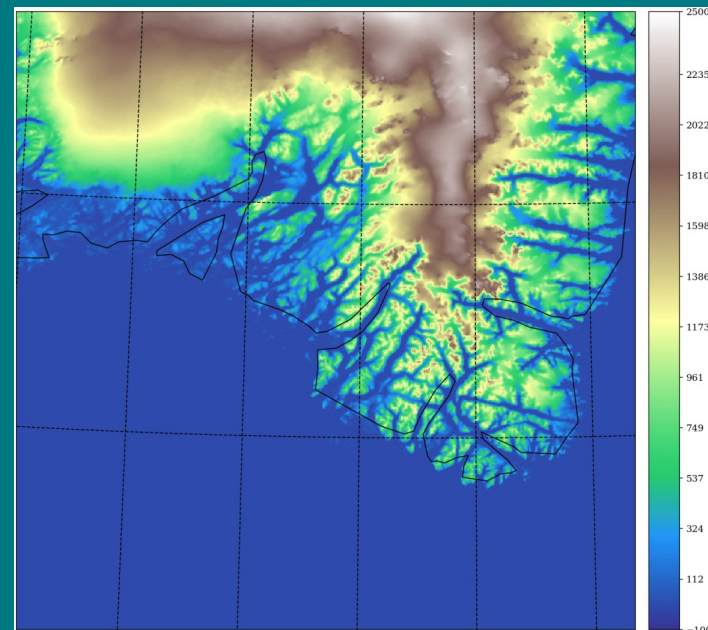
3. **Stability tests at 500m and 200m**

Alps

Problems initially with PGD
for very large domains

Struggling to stabilise at 200m
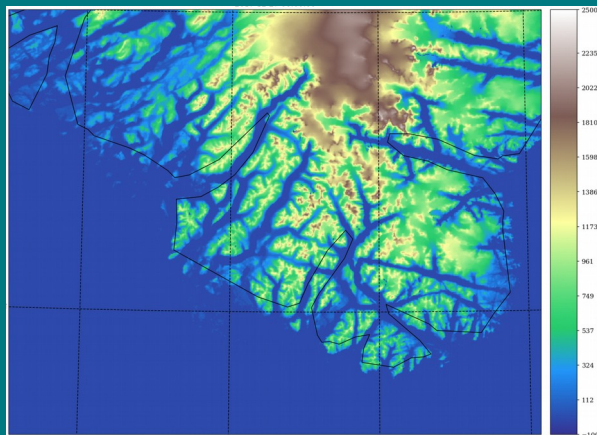horizontal resolution

Greenland

Extreme storm case at 500m with linear grid and 90 levels requires:

- 5s timestep with SETTLS
- 8s timestep with predictor-corrector

along with lots of diffusion, off-centring, low SITRA ….

10s not possible even with NSITER=2

To be continued...

Initial imbalances?
Digital Filter, or more stable early steps (NFOST?)

Intermediate resolution, jump from global?

Spectral grid, "resolution", orography treatment